

1 TO WHOM IT MAY CONCERN:

2

3 BE IT KNOWN THAT WE, LI-MING CHENG, a citizen  
4 of Taiwan, residing in Kaohsiung, in the Country of  
5 Taiwan, and LAWRENCE S. WU, a citizen of the United  
6 States of America, residing in Rowland Heights, in the  
7 County of Los Angeles, State of California, have  
8 invented a new and useful improvement in

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11 PULL DOWN, PUSH UP, SHADE APPARATUS

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**BACKGROUND OF THE INVENTION**

This application is a continuation-in-part of prior pending U.S. patent application serial number 10/632,776, filed July 21, 2003, which is a continuation-in-part of prior pending U.S. patent application serial number 10/360,305, filed February 10, 2003.

This invention relates generally to window shade control, and more particularly to simplification in raising and lowering pleated window shades and Venetian blinds without requiring manipulation of a cord or cords hanging downwardly from an upper support or rail member.

The use of hanging cords requiring manual manipulation has been thought to be required for the raising and lowering of window shades, and particularly pleated shades and/or Venetian blinds. Such cords are frequently difficult to operate correctly, and their use can result in inaccurate or unwanted shade or blind movement, as well as risk of entanglement with small children, and possible strangulation. There is need for a cordless and pleated window shade or Venetian blind assembly which can be easily operated as by

1 simply exerting up or down light force on the lower  
2 hanging portion of the assembly.

3           There is also need for a pleated window shade  
4 or Venetian blind assembly that is easily operated, and  
5 can be automatically kept level, upon adjustment at  
6 one location.

7                           **SUMMARY OF THE INVENTION**

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9           It is a major object of the invention to  
10 provide apparatus and method of operation, meeting the  
11 above needs. Basically, the invention is embodied in a  
12 pleated shade or Venetian blind assembly capable of  
13 height adjustment, comprising, in combination:

- 14                   a) an upper elongated support,  
15                   b) a lower elongated member that is  
16 manually adjustable up and down,  
17                   c) primary lines extending through shade  
18 pleats or blind slats to suspend said bottom elongated  
19 member,  
20                   d) primary rotors at said top elongated  
21 support to wind or engage said primary lines,  
22                   e) at least one secondary line having  
23 operative connection to said primary lines,  
24                   f) and means acting on said secondary line  
25 or lines for counterbalancing suspension force exerted

1 on said primary lines at different shade or blind  
2 height adjusted levels,

3 g) said means including dual rotary members  
4 exerting tensioning force on said secondary line or  
5 lines,

6 h) said means including a spring coupled to  
7 said dual rotary members and exerting force tending to  
8 entrain said secondary line or lines about said dual  
9 rotary members, for storage on at least one of the  
10 members,

11 i) and the secondary lines feeding between  
12 the members, for example in a criss-cross pattern, to  
13 assist in said spring exertion of force, acting to hold  
14 the shade or blind in selected position.

15 It is another object of the invention to  
16 provide a spring, as referred to, which has S-shaped  
17 configuration, whereby the spring winds in a clockwise  
18 direction about one of said members, and in a  
19 counterclockwise direction about the other of said  
20 members. As will be seen, at least one member has  
21 coaxial first and second surface portions, the spring  
22 winding about the first portion, and the secondary line  
23 winding about the second portion. Typically, each of  
24 the members has coaxial first and second surface  
25 portions, the spring winding about the first portion  
26 and the secondary line or lines winding about the

1 second portion. The spring acts as a shade or blind  
2 balancing spring, to hold the shade or blind in any  
3 selected vertical position.

4 Yet another object includes provision of a  
5 housing, and posts in the housing supporting the  
6 members for free rotation about axes defined by the  
7 posts. Annular caps may be associated with the posts  
8 and members, for axially positioning the members in the  
9 housing. The latter is typically defined by a portion  
10 of said upper elongated support which is a shade or  
11 blind head rail.

12 A further object includes the provision of  
13 means acting on the above defined secondary line or  
14 lines for counterbalancing suspension force exerted on  
15 said primary lines at different shade or blind height  
16 adjusted levels, said means including a dual rotary  
17 member entraining said secondary line, and a spring  
18 operatively connected to said dual rotary members. As  
19 referred to, that spring may advantageously have S-  
20 shaped, flat surface configuration.

21 It is another object of the invention to  
22 provide a rotary member exerting tensioning force on  
23 the secondary line or lines; and to provide a number of  
24 such secondary line or lines less than the number of  
25 said primary lines, whereby, the rotary member of small  
26 dimension is able to controllably store a maximum

1 number of windings, within the confines of a reduced  
2 dimension upper support member, such as a channel  
3 configured rail.

4           It is yet another object of the invention to  
5 provide a path of travel for the defined line  
6 connection or interconnection, which may be a junction  
7 connection traveling lengthwise of the upper support,  
8 and which does not pass over any rotors, and whereby  
9 possible derailment of that connection by a rotor is  
10 prevented. In this respect, the primary rotors  
11 preferably include a first rotor having spacing from  
12 said counterbalancing means which exceeds said path of  
13 travel, for shade or blind height adjustment between  
14 uppermost and lowermost positions.

15           Further, the primary rotors may typically  
16 include rotors over which the primary lines are  
17 entrained, along different paths of entrainment, as  
18 will be seen.

19           Yet another object includes containment by  
20 the upper support of all of the primary rotors and the  
21 tensioning means; the provision of primary lines that  
22 have first terminals operatively connected to said  
23 lower elongated member, below said upper support; and  
24 wherein the primary lines have second terminals  
25 operatively connected to said junction connection,  
26 within said upper support.

1                    Yet another object is to provide a dual  
2 rotary/spring system for use in lowering and raising  
3 window coverings which include pleated shades and  
4 Venetian blinds, the system comprised of an elongated  
5 spring unit which has the same thickness and same shape  
6 at both of its ends and operates in conjunction with  
7 the dual rotary apparatus that acts as a secondary line  
8 collecting apparatus and housing for the spring unit.  
9 The secondary line collecting apparatus having roller  
10 shape operates in conjunction with the spring system to  
11 provide counterbalancing force exerted by the weight of  
12 the shade or blind lower elongated member and pleated  
13 materials or blind slats. By criss-crossing the  
14 secondary line that feeds onto a second drum, a spring  
15 unit is aided in returning back to its housing or  
16 support, and thereby prevents the spring unit from  
17 losing its elasticity.

18                  A further object includes provision of the  
19 secondary line in the form of a durable, small diameter  
20 Nylon or other high tension line that minimizes the  
21 amount of storage space required of the secondary line  
22 collecting apparatus located in the upper elongated  
23 member (head rail) channel. The single secondary line  
24 also reduces the length of the shade or Venetian blind  
25 primary line (or cords) and thereby reduces the

1 likelihood of cord entanglement or ''hang-up'' as may  
2 occur when too many cords are bunched up together.

3           An added object is to provide rotors or  
4 pulleys that also serve to diminish the likelihood of  
5 shade or blind cord entanglement or cord jamming when a  
6 member cords overlap each other causing them to be  
7 wedged together. Rotors and pulleys as provided also  
8 serve to balance the weight of the shade or Venetian  
9 blind, and enable a single dual rotary/spring system to  
10 power or displace different sizes of shades or  
11 Venetian blinds. The number of rotors or pulleys may  
12 be adjusted for larger shades or blinds in order to  
13 compensate for the weight of the shade or blind and aid  
14 in balancing the shade or blind. Multiple of the  
15 primary lines together entrain at least one rotor to  
16 help create counterbalance force.

17           Another object is to provide two types of  
18 dual rotary/spring system mountings; i.e. roller mount  
19 configuration or bracket mount configuration. In the  
20 roller mount configuration, at least some parts of the  
21 upper elongated member (head rail) channel protrude  
22 outwardly. In the bracket mount configuration, the  
23 head rail may be slightly larger to accommodate the  
24 dual/rotary spring system. However, in the bracket  
25 mount configuration the head rail typically need not  
26 protrude outwardly. The bracket mount configuration

1 may be adapted to use on both pleated shades and mini-  
2 blinds.

3           These and other objects and advantages of the  
4 invention, as well as the details of an illustrative  
5 embodiment, will be more fully understood from the  
6 following specification and drawings, in which:

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8                           **DRAWING DESCRIPTION**

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10           Fig. 1 is a perspective view of an improved  
11 pull cordless shade assembly, in shade lowered  
12 position;

13           Fig. 2 is a perspective view of pulleys and  
14 rollers mechanism and lines employed to raise and lower  
15 the shade pleats or blind slats;

16           Figs. 3 and 4 are schematic views of shade or  
17 blind line entrainment by a row of pulleys, as used in  
18 the Fig. 2 mechanism;

19           Fig. 5 is a perspective view of pulley  
20 support structure;

21           Fig. 6 is a perspective view of an S-shaped  
22 spring and spring mounting structure, employed in the  
23 Fig. 2 mechanism;

1           Fig. 7 is a view like Fig. 2, showing primary  
2   and secondary lines, and their entrainment, in greater  
3   detail;

4           Fig. 8 is a perspective view like Fig. 6;

5           Fig. 9 is a view like Fig. 1, but showing the  
6   shade in raised position;

7           Fig. 10 is an exploded perspective view  
8   showing spring, spring mount and line storage elements  
9   of Figs. 7 and 8;

10          Fig. 11 is a view like Fig. 1, showing a  
11   modified pull-type cordless shade or blind assembly, in  
12   lowered condition, and employing brackets;

13          Fig. 12 is a perspective view of bracket  
14   structures for supporting pulleys; and line storage  
15   rotors of the type seen in Fig. 2;

16          Fig. 13 is an enlarged perspective view of a  
17   single U-shaped bracket as is employed in Fig. 12;

18          Fig. 14 is an exploded perspective view like  
19   Fig. 10, showing bracket mounting of elements in  
20   greater detail;

21          Figs. 15 and 16 are end views showing  
22   retention of elements as seen in Fig. 14, in a head  
23   rail; and

24          Figs. 17 and 18 are schematic views of  
25   multiple cord entrainment by rollers, in a manner  
26   similar to Figs. 3 and 4.

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## DETAILED DESCRIPTION

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4           In Figs. 1, 2 and 7, a pleated shade or  
5 Venetian blind assembly 10 is capable of height  
6 adjustment without use of external pull cords. It  
7 includes an upper elongated support 11 which may be in  
8 the form of a metallic or plastic channel or rail 12  
9 which may be otherwise hollow, attachable to a window  
10 frame 200, as by fastener 201. The assembly also  
11 includes a lower elongated slat member 13 that is to be  
12 simply and easily manually adjusted up or down, as  
13 indicated by arrows 14 and 15, and to selected levels.  
14 Shade pleats 16 are located between and connected to 12  
15 and 13, as shown. The pleats may be foldable, and  
16 expand or separate as member 13 is urged downwardly, to  
17 selectively adjusted height position, for example  
18 controllably covering a window. The pleats or slats  
19 collapse toward one another as the member 13 is  
20 elevated toward 12, to adjusted position or positions.  
21 Pleats or slats expand as at 60, from stacked positions  
22 as at 61 in Fig. 9.

23           Primary lines or cords are provided to extend  
24 generally vertically through the pleats or slats, as  
25 seen in Fig. 1, to suspend the lower member 13. See

1 for example two lines 20 and 21, connected at their  
2 lower ends or terminals 20a and 21a to member 13, at  
3 laterally spaced positions. Two such lines are shown,  
4 but three may be provided, as for a larger width shade  
5 or blind.

6           Primary rotors are provided at the upper  
7 support or rail 11, to entrain the primary lines, and  
8 guide them toward a common connection or junction 22  
9 (see Fig. 7) with at least one secondary line 24 which  
10 moves endwise relative to 12, and parallel to 12 as  
11 connection 22 is moved endwise. The number of  
12 secondary lines is less than the number of primary  
13 lines, for reasons as will appear. Typically, there is  
14 only one secondary line 24, and two primary lines, such  
15 as lines 20 and 21. In that event, connection 22  
16 connects the leftward terminals of lines 20 and 21 with  
17 the rightward terminal of line 24, whereby movement of  
18 that connection 22 and line 24 in one direction tends  
19 to equally raise primary line terminals 20a and 21a  
20 keeping 13 level; and movement of connection 22 and  
21 line 24 in the opposite direction tends to equally  
22 lower primary line terminals 20a and 21a, the lower  
23 member thereby being maintained in horizontal condition  
24 as it is raised and lowered, as by manually grasping  
25 13.

1                Means is provided for acting on the secondary  
2 line or lines 24 for exerting force counterbalancing  
3 the suspension force exerted on the primary lines, by  
4 the weight of the lower member 13, and pleats or slats,  
5 as at each of different shade or blind height adjusted  
6 levels. Such counterbalancing force enables stable  
7 suspension of the lower member 13 at any vertical  
8 position to which it is raised or lowered. Such means  
9 is generally indicated at 30 in Fig 10, and other  
10 figures, and may take different forms, but preferably  
11 enabling its reception as shown within the confining  
12 channel shaped support 11, as near one end thereof.

13 See Fig. 1.

14                Means 30 may include rotary members 34 and  
15 35, a housing 30a, and a tension exerting torsion  
16 spring element 32 received within 30a. The line 24 is  
17 typically wound onto or off members 34 and 35 and  
18 spring force is exerted by 32 on the members in a line  
19 winding direction, to provide the counterbalancing  
20 force or tension referred to. That force is maintained  
21 as the shade or blind is raised or lowered to stable  
22 adjusted position, and static friction may be provided  
23 in or by one or more elements of the means 30, acting  
24 to hold the lower member 13 at selected height  
25 adjustment. Since only one line 24 is typically

1   spooled at members 34 and 35, the sizes of 34 and 35  
2   may be minimized to fit within channel 12.

3               The referenced counterbalancing means, as  
4   stated, includes a spring coupled to dual rotary  
5   members and exerting force tending to entrain the  
6   secondary line or lines 24 about said dual rotary  
7   members, for storage on at least one of the members.  
8   See for example the spring 32 which has S-shaped  
9   configuration, so as to wind or coil at 32a in a  
10   clockwise direction about a first portion 34a of member  
11   34, and so as to wind or coil at 32b in a  
12   counterclockwise direction about a first portion 35a of  
13   rotary member 35. The secondary line 24 winds at 24a  
14   about a second portion 34b of the member 34, and at 24b  
15   about a second portion 35b of cylindrical member 35, as  
16   shown. Portions 34a and 34b are coaxial, and portions  
17   35a and 35b are also coaxial, as shown. Members 34 and  
18   35 are offset from one another to enable line 24  
19   winding as shown. Line portions 24c and 24d extend  
20   between the members in criss-crossing relation, and aid  
21   in production of counterbalance force. Spring 32 is  
22   preferably a flat spring of constant width. The  
23   invention makes it possible to use different sizes of  
24   springs, to exert different forces, to accommodate to  
25   different shade widths or heights, without changing the  
26   design of the overall mechanism.

1               Note in Fig. 10 the attachment of spring end  
2   32c to member 34, as for example by means of a fastener  
3   or set screw 36; and the attachment of spring end 32d  
4   to member 35, as by means of fastener or set screw 37.  
5   The spring ends may be attached to the two members as  
6   by other means, such as bonding, or by spring end  
7   turning into grooves in the members.

8               Fig. 10 also shows that housing 30a includes  
9   a receptacle 39. Posts 40 and 41 positioned in 39  
10   extend in parallel relation and into bores 34e and 35e  
11   in the rotary members, to mount those members for  
12   rotation. Flanges 42-47 position the members 34 and 35  
13   and the spring, for endwise back and forth operation of  
14   line 24, through opening 48 in the receptacle, with  
15   spring tension balancing the weight of the hanging  
16   shade or blind, at any selected height position,  
17   whereby the shade or blind, remains in selected height  
18   position. Receptacle 39 is typically received in the  
19   hollow defined by head rail 12.

20              In Figs. 1-10, the coiling of the spring  
21   about 35a increases as the shade or blind is pulled  
22   down. This decreases spring coiling about 34a.  
23   Conversely, the coiling of the spring about 34a  
24   increases as the shade or blind is moved up. This  
25   decreases spring coiling about 35a. In this way, the  
26   spring and members 34 and 35 and line 24 winding as

1 described act as a force balancing device to maintain  
2 the shade or blind at any selected elevation.

3 Figs. 2 and 7 show a series of primary  
4 pulleys or rotors 50-53, otherwise identified as  
5 rotors or pulleys 1, 2, 3 and 4, as shown. They serve  
6 to entrain the primary lines 20 and 21 in back and  
7 forth relation collecting those lines as seen in Figs.  
8 3 and 4, so as to enable the junction 22 to travel  
9 between rotor 50 and the line 24 winding member 34, as  
10 the shade or blind is moved up and down. Line 20  
11 travels in sequence partly around rotor 51, then partly  
12 around rotor 53, then returns partly around rotor 50,  
13 then again partly around rotor 53, then returns past  
14 rotors 51 and 50 to junction 22. Line 21 travels in  
15 sequence partly around rotor 52, then partly around  
16 rotor 53, then turns at rotor 50 and turns around it to  
17 return about rotor 53, and then passes over rotors 51  
18 and 50 and junction 22. These rotors and/or pulleys  
19 also serve to assist in balancing of the hanging shade,  
20 or blind, for enabling a single dual rotary spring  
21 system (see Figs. 6 and 10) to power the shade or  
22 blind, which may be of different widths. Rotors 50,  
23 53, 52 and 51 are otherwise labeled 1, 2, 3, and 4.

24 Figs. 2 and 5 show typical support of axle 59  
25 on rotor 53, by a bracket mount configuration 60, with  
26 the rotors having pulley shape.

1                    Fig. 9 shows the rotors and the spring system  
2    mounted within a channel shaped, transversely elongated  
3    head rail 11. The pleats or slats are collapsed in  
4    raised position as shown.

5                    Figs. 11-13 show a series of bracket mount  
6    configurations 70-72 carried by the head rail, to pass  
7    the primary lines between successive pulleys. The  
8    bracket mount configurations are notched as at 73 to  
9    support a shade or blind winding rod 74, that serves to  
10   tilt the shade or blind strips 75 in a shade, when a  
11   control wand 76 is rotated about its axis, such tilt  
12   control being known.

13                   Fig. 14 shows, in greater detail, support  
14   bracket mount configurations 85 and 86, for elements  
15   32, 34 and 35 as described above, and as seen in Fig.  
16   12. See also posts 40 and 41, supported by bracket  
17   mount configurations 85 and 86. The brackets are  
18   typically positioned within a head rail or channel, as  
19   seen at 12 in Fig. 1. Rail or channel is attachable to  
20   a window frame structure.

21                   Fig. 13 also shows lines 90 and 91 which  
22   extend downwardly from clip 92 on wand 74, and pass  
23   through bracket mount 72 and to blind strips 75, to  
24   tilt them when wand 74 is rotated. Bracket flanges 93  
25   and 94 define windows 95 and 96 to pass the lines 97

1 extending to the rotary members as at 34 and 35 in Fig.  
2 12.

3 In Figs. 15 and 16, the elongated bracket  
4 mount configurations 85 and 86 are shown assembled into  
5 a head rail 98. The latter has curved side walls 99  
6 and 100 holding the flanges 85a and 86a of the mount  
7 configurations 85 and 86 in captivated and inwardly  
8 deflected positions, whereby the rotary members as at  
9 34 and 35 are axially retained and centered by base  
10 elements 85c and 86c of 85 and 86, as shown. Fig. 15  
11 shows the shade in raised position, and Fig. 16 shows  
12 the shade in lowered position. The head rail 98 is  
13 adapted to be attached to window frame structure 102.

14 Fig. 17 is similar to Figs. 3 and 4, and  
15 schematically shows shade primary lines 104 and 105  
16 entrained by rotors labeled 1, 2, 3 and 4. A junction  
17 106 joins ends of 104 and 105 with secondary line 107.  
18 A roller labeled 5 deflects lines 104 and 105, as  
19 shown, in a way that creates added force to assist in  
20 shade counterbalancing.

21 Fig. 18 is like Fig. 17, but three primary  
22 lines 113, 114, and 115, are employed to support the  
23 shade. A secondary line 117 is joined to ends of 113-  
24 115 at junction 116. Rollers 1, 2, 3, 4 and 7 entrain  
25 the back and forth oriented lines 113-115, as  
26 schematically shown.